

Evaluating Status and Trends in Fecal Pollution in Puget Sound through 2004

Tim Determan,

Coordinator, Puget Sound Ambient Monitoring Program

Food Safety and Shellfish Programs

Division of Environmental Health

Washington State Department of Health

P.O. Box 47824, Olympia, WA 98504-7824

E-mail: tim.determan@doh.wa.gov

Keywords: fecal, pollution, shellfish, status, trend

Abstract

The Washington State Department of Health (DOH) classifies shellfish beds according to procedures set by the National Shellfish Sanitation Program (NSSP). These procedures were adapted to evaluate status and trends in fecal pollution impact. Since 1999, DOH has reported results annually through the Puget Sound Ambient Monitoring Program (PSAMP). DOH recently completed an analysis through 2004. Over eight thousand statistics (geometric means and 90th percentiles) were summarized for results from 1,262 sampling sites in 98 shellfish growing areas of Puget Sound, the San Juan Islands, and the Straits of Juan de Fuca and Georgia (U.S. jurisdiction). DOH uses 90th percentiles for analysis of status and trends. Ninety percent of 90th percentiles were GOOD (≤ 30 MPN per 100ml). Four percent of sites were FAIR (>30 , but ≤ 43 MPN per 100ml). Six percent of sites were BAD (>43 MPN per 100ml). A fecal pollution index (FPI) was developed to rank growing areas according to fecal pollution impact (FPI range: 1.0-3.0). Twenty nine areas suffered significant impact (FPI >1.0). Five-year trends were determined for sites with 90th percentiles greater than 10 MPN per 100ml and/or records 3-5 years long (35%). Fecal pollution decreased at 16.2% of 1,262 sites, 12.5% worsened, and 6.7% showed no net change.

Background

Prior to 1980, "point source" discharges of sewage were identified as the main source of contamination in shellfish growing areas of Puget Sound. Since then, "nonpoint" fecal sources from adjacent uplands have become the major pollution factor. Stakeholders needed to see whether nonpoint source control programs worked.

The procedure mandated by the National Shellfish Sanitation Program (NSSP) to classify shellfish beds for harvest was adapted to measure status and detect trends in fecal pollution in marine waters.

NSSP Criteria

The NSSP criteria used to classify shellfish growing areas are:

Criterion 1: Fecal coliform levels in water samples shall not exceed a geometric mean value of 14 organisms per 100ml.

Criterion 2: The estimated ninetieth percentile of fecal coliform shall not exceed 43 MPN per 100ml.

Other important factors:

- A minimum of 30 previously collected results are needed to calculate the statistics
- Both criteria must be met
- An area approved for harvest cannot be subject to direct pollution discharges
- DOH cannot approve a harvest area if pollution sources may harm public health even if water quality is acceptable.

Analytical Approach

The following analytical approach was used:

- Only continually sampled stations were used for the analysis
- All sampling sites were used, including those closed for harvest by DOH.

- Ninetieth percentiles were used for status and trends because they are more sensitive than geometric means to change.

Status of Growing Areas and Ranking by Fecal Pollution Impact

Figure 1 summarizes status of 98 classified shellfish growing areas in 2004. For each growing area 90th percentiles from all stations for all sampling dates were sorted into three categories: **GOOD** (≤ 30 MPN per 100ml); **FAIR** (>30 , but ≤ 43 MPN per 100ml); and **BAD** (>43 MPN per 100ml). A pie chart for each growing area shows the fraction of 90th percentiles in each category.

The fraction of 90th percentiles in each category was multiplied by a “weighting factor” (GOOD=1; FAIR=2; BAD=3). The weighted values were summed to produce a Fecal Pollution Index (FPI) for each growing area. The resulting indices were then sorted according to the value of the FPI. Figure 2 shows the ranking of the 29 shellfish growing areas in 2004 with FPI exceeding 1.0.

Sound-wide Summary of Analysis

Figure 3a provides a Sound-wide fecal pollution analysis of status and trend for 2004. Over 8,000 90th percentiles calculated from 1,262 stations in 98 areas were sorted into the appropriate categories. Nearly 90% of stations were GOOD (≤ 30 MPN per 100ml), 4% FAIR (>30 , but ≤ 43 MPN per 100ml), and 6% BAD (>43 MPN per 100ml).

Figure 3b summarizes 5-year trends at the 1,262 stations. Trend was examined at a station if any 90th percentile in its record exceeded 10 MPN per 100ml. About 16% of the stations showed decline in fecal pollution, while 12.5% showed worsening pollution. Nearly 7% of stations showed no net change. Trend at 64.5% of the stations was not determined. In most cases, these stations did not have any 90th percentiles above 10 MPN, but sometimes the record was too short for analysis.

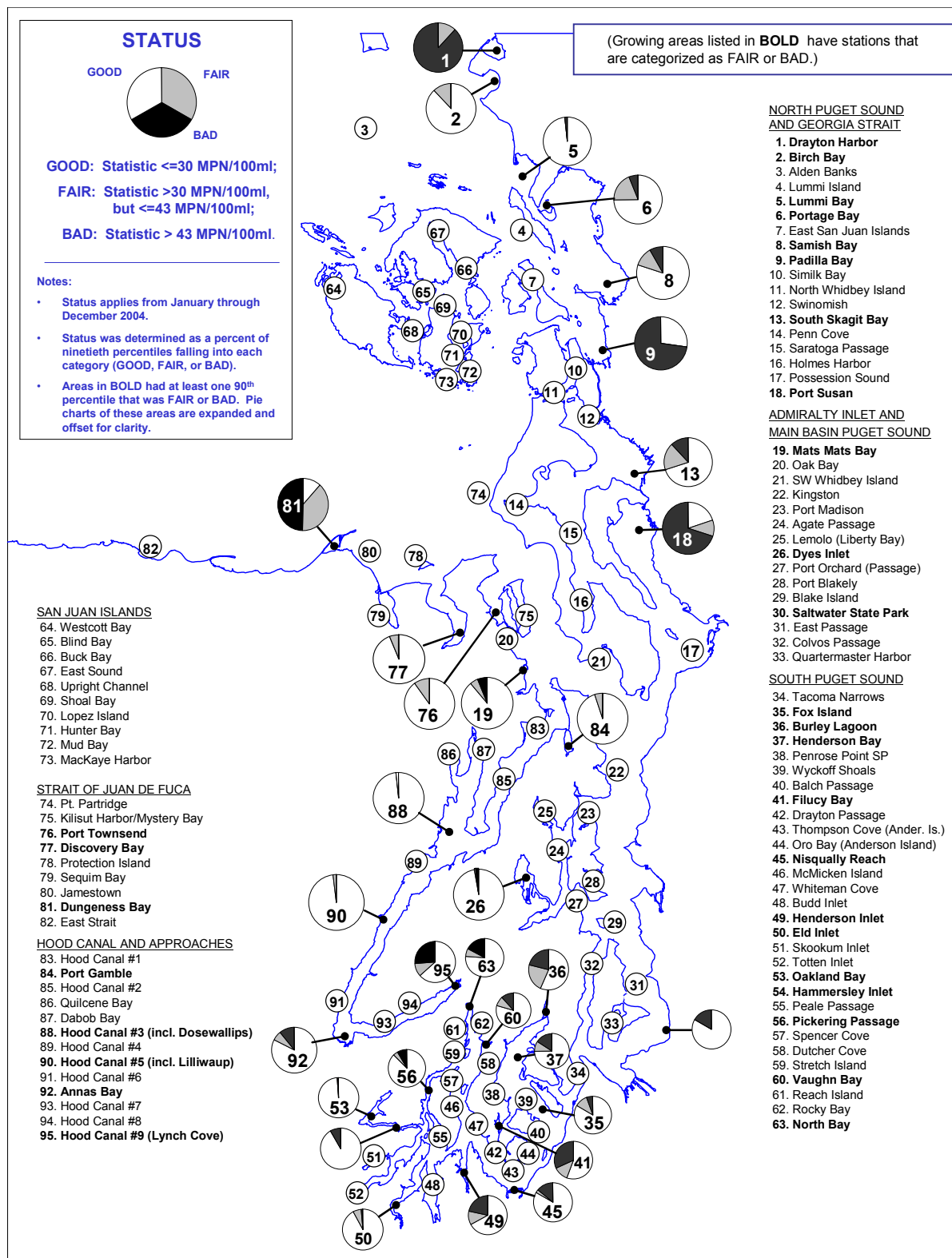
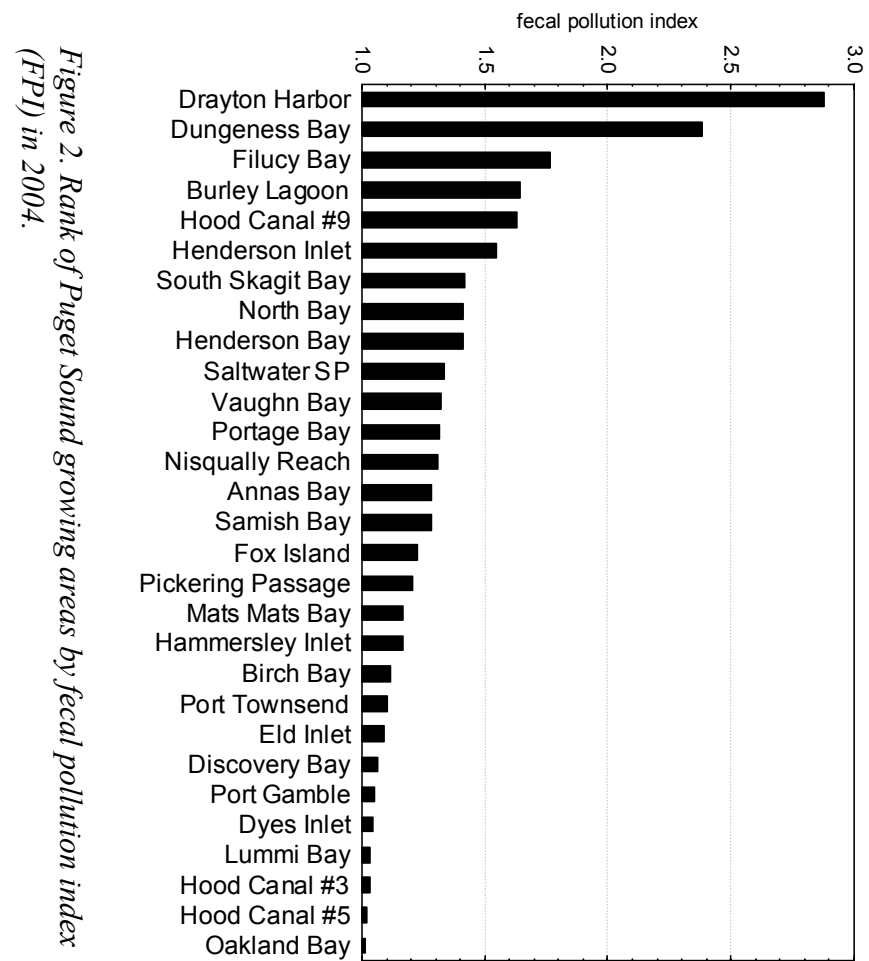


Figure 1. Status of Fecal Pollution in Puget Sound growing areas in 2004.



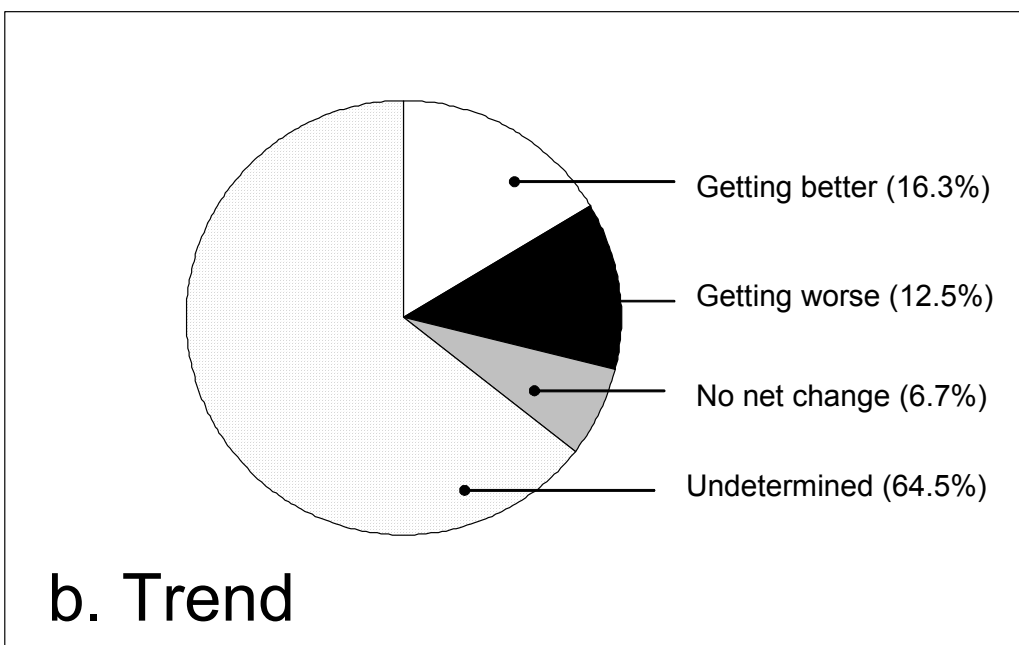
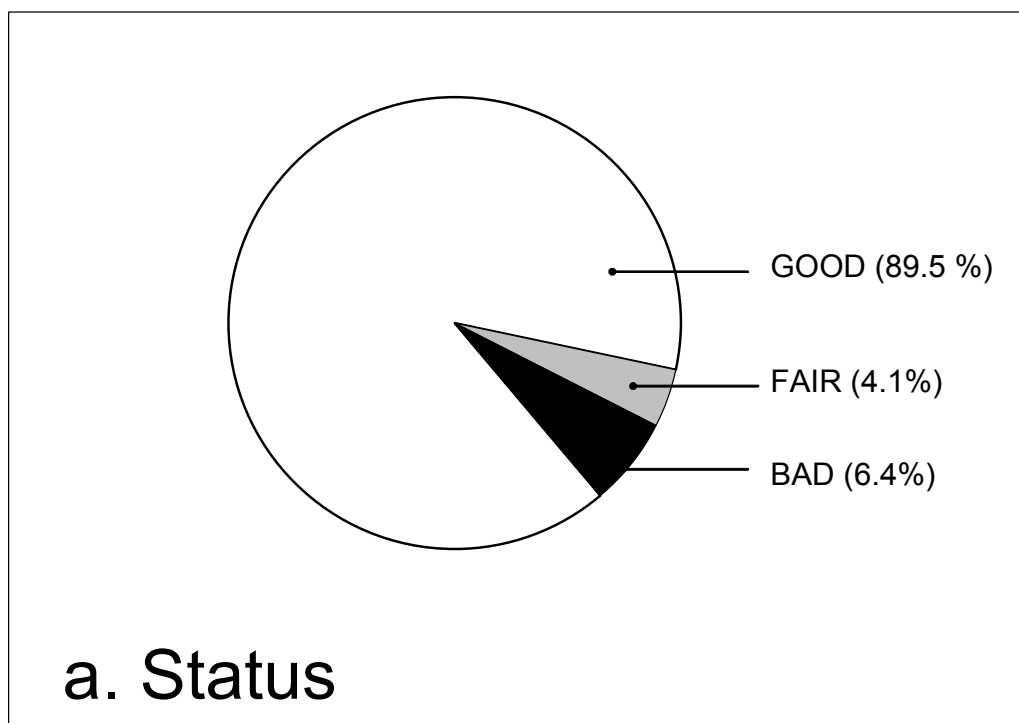


Figure3. Sound-wide summary of 2004 analysis for status and trend in fecal pollution in Puget Sound.